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(54) FILM UNIT WITH LENS PROVIDED WITH BUILT-IN FLASH

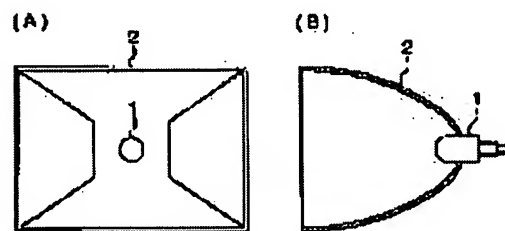
(57)Abstract:

PROBLEM TO BE SOLVED: To realize flash photographing with a simple circuit and to realize miniaturization and the reduction of the cost by using a white light emitting diode having three chips respectively emitting red light, blue light and green light as a light source for a flash.

SOLUTION: This film unit is equipped with the white light emitting diode 1 emitting flash light and a reflector 2 reflecting the flash light emitted by the diode 1 toward a subject at the specified angle of view.

The diode 1 is a light emitting diode having three chips respectively emitting the red light, the blue light and the green light, so that only the optional chip can emit the light or plural specified chips can emit the light. In the case of using the film unit for ordinary flash photographing, the red light, the blue light and the green light are simultaneously emitted as equal color light. Then, white light is emitted due to the

additive color mixture of three primary colors of the light. However, when it is intended to illuminate the subject in the special color, the light is emitted as unequal color light even when the optional chip is made to emit the light or three chips are made to emit the light simultaneously.



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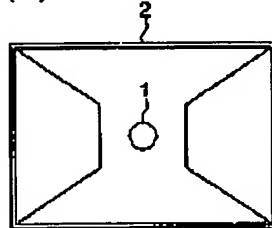
(54) 【発明の名称】 フラッシュ内蔵レンズ付きフィルムユニット

(57) 【要約】

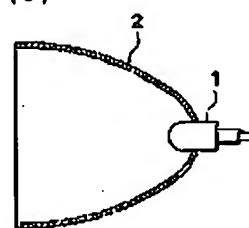
【課題】 小型化及び原価低減に大きく寄与する、非常に簡単な回路のフラッシュを内蔵したレンズ付きフィルムユニット。

【解決手段】 赤色光、青色光、及び緑色光を各々発光する3枚のチップを有する白色発光ダイオード1をフラッシュの光源に用いたこと。

(A)



(B)



【特許請求の範囲】

【請求項1】 赤色光、青色光、及び緑色光を各々発光する3枚のチップを有する白色発光ダイオードをフラッシュの光源に用いたことを特徴とするフラッシュ内蔵レンズ付きフィルムユニット。

【請求項2】 前記白色発光ダイオードより赤色光、青色光、及び緑色光を均等な色光で発光させることを特徴とする請求項1に記載のフラッシュ内蔵レンズ付きフィルムユニット。

【請求項3】 赤色光を発光する発光ダイオード、青色光を発光する発光ダイオード、及び緑色光を発光する発光ダイオードをフラッシュの光源に用いたことを特徴とするフラッシュ内蔵レンズ付きフィルムユニット。

【請求項4】 前記3個の発光ダイオードを均等な色光で同時に発光させることを特徴とする請求項3に記載のフラッシュ内蔵レンズ付きフィルムユニット。

【請求項5】 予め製造工程で内蔵するフィルムのISO感度を1000以上としたことを特徴とする請求項1～4の何れか1項に記載のフラッシュ内蔵レンズ付きフィルムユニット。

【請求項6】 フラッシュ撮影モードへの切り替えに連動して、シャッタ速度を1/60以下に切り替えることを特徴とする請求項1～5の何れか1項に記載のフラッシュ内蔵レンズ付きフィルムユニット。

【請求項7】 フラッシュ用電源として、単4形電池、若しくは単5形電池を2本用いたことを特徴とする請求項1～6の何れか1項に記載のフラッシュ内蔵レンズ付きフィルムユニット。

【請求項8】 フラッシュ用電源として、単3形電池、単4形電池、若しくは単5形電池を1本用い、前記白色発光ダイオードの駆動電圧まで昇圧させる昇圧回路を備えたことを特徴とする請求項1、2、5または6に記載のフラッシュ内蔵レンズ付きフィルムユニット。

【請求項9】 フラッシュ用電源として、単3形電池、単4形電池、若しくは単5形電池を1本用い、前記3個の発光ダイオードの駆動電圧まで昇圧させる昇圧回路を備えたことを特徴とする請求項3～6の何れか1項に記載のフラッシュ内蔵レンズ付きフィルムユニット。

【発明の詳細な説明】

【0001】

【発明の属する技術分野】本発明はフラッシュを内蔵したレンズ付きフィルムユニットに関する。

【0002】

【従来の技術】ストロボを内蔵したレンズ付きフィルムユニットは従来より各種市販されている。しかし、ストロボを発光させる回路は複雑であり、電池の電圧を略3.5Vに昇圧させる発振トランス等の昇圧回路、充電した電荷を蓄える大型のメインコンデンサ、充電したことを表示するネオン管等の表示回路、放電管にトリガー電圧を付与するトリガートランス等の各種の回路を必要と

した。このために、ストロボを内蔵すると小型化は困難であり、また原価高になっていた。

【0003】また、ストロボ撮影のときは、メインコンデンサが充電してネオン管が点灯するまで待たなければならず、シャッタチャンス逃してしまうといったことがしばしばあった。

【0004】

【発明が解決しようとする課題】かかる問題に鑑み、非常に簡単な回路でフラッシュ撮影が可能なフラッシュ内蔵レンズ付きフィルムユニットを提案することを本発明の課題とするものであり、この結果、小型化、原価低減に寄与するところが大きく、更にフラッシュ撮影時に待ち時間を不要としたものである。

【0005】

【課題を解決するための手段】上記課題は下記の何れかにより解決される。

【0006】①赤色光、青色光、及び緑色光を各々発光する3枚のチップを有する白色発光ダイオードをフラッシュの光源に用いたことを特徴とするフラッシュ内蔵レンズ付きフィルムユニット。

【0007】②赤色光を発光する発光ダイオード、青色光を発光する発光ダイオード、及び緑色光を発光する発光ダイオードをフラッシュの光源に用いたことを特徴とするフラッシュ内蔵レンズ付きフィルムユニット。

【0008】

【発明の実施の形態】本発明のフラッシュ内蔵レンズ付きフィルムユニットにおける実施の形態を図1乃至図6を参照して詳細に説明する。

【0009】図1はフラッシュ発光部の図であり、図1(A)は正面図、図1(B)は縦断面図である。

【0010】同図において、1はフラッシュ光を発光する白色発光ダイオード、2は白色発光ダイオード1が発光したフラッシュ光を被写体に向けて所定の画角で反射する反射傘である。白色発光ダイオード1は赤色光、青色光、及び緑色光を各々発光する3枚のチップを有する発光ダイオードであり、3枚のチップの内、任意のチップのみを発光させることもでき、また所定の複数のチップを発光させることもできる。通常のフラッシュ撮影のために用いるときは、赤色光、青色光、及び緑色光を均等な色光で同時に発光させる。すると、光の三原色の加色混合により白色光が発光する。しかし、被写体を特殊な色に照明したいときは、任意のチップを発光させるか、若しくは3枚のチップを同時に発光させても不均等な色光で発光させればよい。

【0011】従って、白色発光ダイオード1の脚の数は、3枚のチップを任意に制御するときは、アース端子を含めて4本の脚が必要であり、常に3枚のチップを均等な色光で同時に発光させるように白色発光ダイオード1を製造したときは、2本の脚があればよい。

【0012】次に、フラッシュ回路図を図2に基づい

て説明する。白色発光ダイオードDは抵抗R、シンクロスイッチS-SWと共に電池Bと直列に接続されている。白色発光ダイオードDは略1.8V~2.5Vの範囲で発光するので、負荷抵抗Rを直列に接続して、3Vとなる2本の電池に接続されている。シンクロスイッチS-SWは図示していないシャッタ羽根の開放動作に連動してオンとなるスイッチである。

【0013】このように本フラッシュ回路は非常に簡単であって、従来のストロボ回路の如く、電池の電圧を高圧に昇圧させる発振トランス等の昇圧回路、充電した電荷を蓄える大型のメインコンデンサ、充電したことを表示するネオン管等の表示回路、放電管にトリガー電圧を付与するトリガートランス等の各種の回路を必要としない。従って、小型化に大きく寄与すると共に、多大な原価低減となり、更に部品点数が削減されるので信頼性が向上する。

【0014】また、充電動作を必要としないので、シンクロスイッチS-SWがオンになりさえすれば白色発光ダイオードDは常に発光するので、ストロボの如き待ち時間は不要であり、充電表示も不要となる。従って、ストロボ撮影の如きネオン管が点灯するまでの待ち時間に貴重なシャッタチャンスを通してしまおうといった問題は生じない。

【0015】なお、3Vとなる2本の電池を必要とするので、電池は単4形若しくは単5形の如き小さい電池が好ましいが、場合によっては、3Vのリチウム電池を1本用いてもよい。

【0016】光量をストックと同一条件で比較すると、現在の白色発光ダイオードを用いたフラッシュは光量が充分でない。この問題を解決するために、下記の対策が必要となる。

【0017】まず、レンズ付きフィルムユニットには製造工程で予めフィルムが装填されるが、高感度のフィルムを装填することによりフラッシュの光量不足を補うことができるので、ISO感度1000以上のフィルムを用いることが望ましい。

【0018】また、シャッタ速度は低速の方がフラッシュの光量不足を補うことができるが、シャッタ速度が定速であると日中での撮影に露出過度になるので、日中等でのフラッシュを用いないときには高速と、フラッシュ撮影のときには低速と、シャッタ速度の切り替えができることが望ましい。そして、フラッシュ撮影時にはシャッタ速度は1/60以下に切り替えられることが望ましい。

【0019】フラッシュ用電源としては、3Vにするため小型で1.5Vの単4形電池、若しくは単5形電池を2本用いることが望ましい。

【0020】また、フラッシュ用電源として1.5Vの単3形電池、単4形電池、若しくは単5形電池を1本のみ用いるときは、図3のフラッシュ回路図の如く構成す

ればよい。

【0021】即ち、メインスイッチM-SWを設け、メインスイッチM-SWをオンさせたときは昇圧回路5により白色発光ダイオードDの駆動電圧、即ち約3.0V以上まで昇圧させて、その電荷をコンデンサCに蓄積し、シンクロスイッチS-SWのオンによりコンデンサCの電荷を放電させることによって白色発光ダイオードDを発光させる。

【0022】なお、発光開始のタイミングは従来のストロボのようにシャッタ全開時ではなく、図4の発光タイミング図に示すようにシャッタ開動作の開始と同時に進行し、シャッタ閉動作の終了時まで発光を持続するようにすることが望ましい。

【0023】以上の実施の形態は、フラッシュの発光源として白色発光ダイオードを1本用いたものであるが、赤色光、青色光、及び緑色光を各々発光する3本の発光ダイオードをまとめて用いてもよい。

【0024】このように構成したフラッシュ発光部の正面図を図5に示す。11は赤色光発光ダイオード、12は青色光発光ダイオード、13は緑色光発光ダイオードであり、14は反射傘である。

【0025】図6に電源として3Vの電池Bを用いたフラッシュ回路図を示す。本フラッシュ回路図は、負荷抵抗R₁に赤色光発光ダイオードD₁、負荷抵抗R₂に青色光発光ダイオードD₂、負荷抵抗R₃に緑色光発光ダイオードD₃を直列に接続したもので、図2に示したフラッシュ回路図と基本的に差はない。従って、図示していないシャッタ羽根の開放動作に連動してシンクロスイッチS-SWがオンになれば、赤色光発光ダイオードD₁、青色光発光ダイオードD₂、及び緑色光発光ダイオードD₃が同時に発光し、均等な3色の加色混合により白色光を発光する。

【0026】また、各々の発光ダイオードと直列に各々スイッチを接続し、任意のスイッチをオン・オフさせて、任意の1個、若しくは2個の発光ダイオードのみを発光させることにより、被写体を特殊な色に照明して取って不自然な発色となる写真表現をすることもできる。

【0027】また、図3に示すように1.5Vの電池を1本用い、昇圧させてから発光ダイオードを発光させるようにしてもよい。

【0028】なお、光量を大きくするために、白色発光ダイオードを複数本用いるか、又は赤色光、青色光、及び緑色光の各々の発光ダイオードを複数本用いるようにしてもよい。特に、赤色光、青色光、及び緑色光の発光ダイオードを複数本用いる場合は、その本数を各色とも同じにする必要はなく、各発光ダイオードの発光強度に応じて所望の発光色と発光強度になるように各色の本数を変えてもよい。

【0029】なお、発光ダイオードの光の放射角度は撮影レンズの撮影画角よりも広いものを用いることが望ま

しい。

【0030】更に、発光させる際に流す電流も許容最大電流を越えない範囲で、それに近い電流を流す回路とすることが望ましい。

【0031】

【発明の効果】請求項1～9に記載のフラッシュ内蔵レンズ付きフィルムユニットによれば、従来のストロボの如き複雑で高価な回路を不要とし、非常に簡単な回路構成となるので、小型化及び原価低減に寄与するところが大きい。また、発光ダイオードを駆動可能な電圧である3Vの電圧の電池を電源として用いれば、常に撮影可能であって、待ち時間が不要であるので、従来のストロボの如きシャッターチャンスを逃すといったことは生じない。

【図面の簡単な説明】

【図1】白色発光ダイオードを用いたフラッシュ発光部の図である。

【図2】白色発光ダイオードを用いたフラッシュ回路図*

*である。

【図3】昇圧回路を備えたフラッシュ回路図である。

【図4】発光タイミング図である。

【図5】3本の発光ダイオードを用いたフラッシュ発光部の正面図である。

【図6】3本の発光ダイオードを用いたフラッシュ回路図である。

【符号の説明】

B 電池

S-SW シンクロスイッチ

M-SW メインスイッチ

C コンデンサ

1、D 白色発光ダイオード

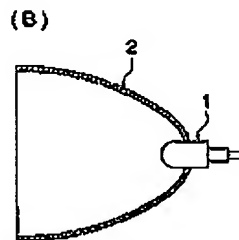
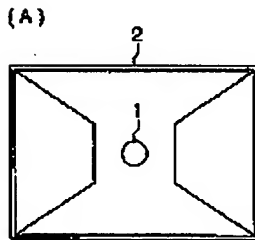
2、14 反射率

11、D、赤色発光ダイオード

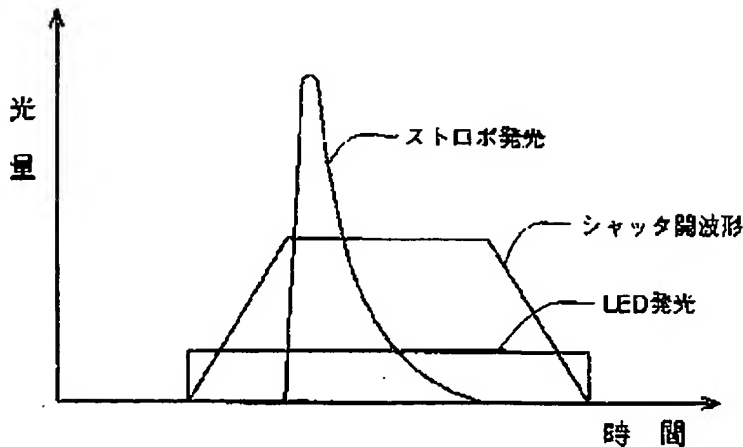
12、D、青色発光ダイオード

13、D、緑色発光ダイオード

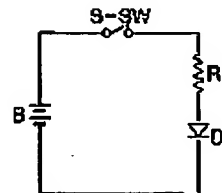
【図1】



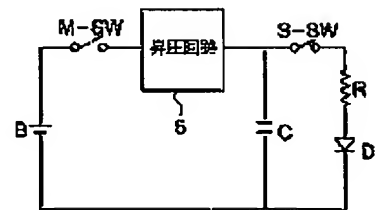
【図4】



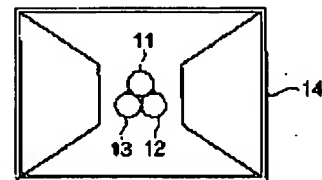
【図2】



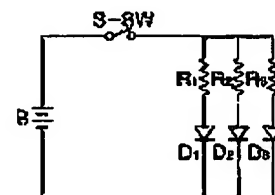
【図3】



【図5】



【図6】



CLAIMS

[Claim(s)]

[Claim 1] A film unit with a lens with a built-in flash plate using for a light source of a flash plate a white light emitting diode which has a chip of three sheets which emits light respectively in red light, blue glow, and green light.

[Claim 2] The film unit with a lens with a built-in flash plate according to claim 1 making red light, blue glow, and green light emit light by equivalent colored light from said white light emitting diode.

[Claim 3] A film unit with a lens with a built-in flash plate using for a light source of a flash plate a light emitting diode which emits light in red light, a light emitting diode which emits light in blue glow, and a light emitting diode which emits light in green light.

[Claim 4] The film unit with a lens with a built-in flash plate according to claim 3 making said three light emitting diodes emit light simultaneously by equivalent colored light.

[Claim 5] A film unit with a lens with a built-in flash plate given in any 1 paragraph of claims 1-4 making or more into 1000 ISO speed of a film beforehand built in by a manufacturing process.

[Claim 6] A film unit with a lens with a built-in flash plate given in any 1 paragraph of claims 1-5 being interlocked with a change in flash-photographs mode, and changing shutter speed to 1/60 or less.

[Claim 7] as the power supply for flash plates -- AAA -- a film unit with a lens with a built-in flash plate given in any 1 paragraph of claims 1-6 using a type cell or a single 5 type cell two.

[Claim 8] as the power supply for flash plates -- AA -- a type cell and AAA -- the film unit with a lens with a built-in flash plate according to claim 1, 2, 5, or 6 by which it is having [using a type cell or a single 5 type cell one]-booster circuit which carries out pressure up to driver voltage of said white light emitting diode characterized.

[Claim 9] as the power supply for flash plates -- AA -- a type cell and AAA -- a film unit with a lens with a built-in flash plate given in any 1 paragraph of claims 3-6 by which it is having [using a type cell or a single 5 type cell one]-booster circuit which carries out pressure up to driver voltage of said three light emitting diodes characterized.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the film unit with a lens which built in the flash plate.

[0002]

[Description of the Prior Art] The film unit with a lens which built in the stroboscope is marketed [various] conventionally. However, booster circuits, such as an oscillation transformer which are complicated as for the circuit which makes a stroboscope emit light, and carries out pressure up of the voltage of a cell to abbreviated 350V, Various kinds of circuits, such as a trigger transformer which gives trigger voltage, were needed

for display circuits, such as a large-sized main capacitor in which the charged electric charge is stored, and a neon bulb which indicates that it charged, and a discharge tube. For this reason, when the stroboscope was built in, the miniaturization is difficult and had become a high cost.

[0003]At the time of speed light photography, it had to wait until the main capacitor charged and the neon bulb lit up, and missing a shutter chance often occurred.

[0004]

[Problem(s) to be Solved by the Invention]It is what makes it the technical problem of this invention to propose the film unit with a lens with a built-in flash plate in which flash photographs are possible in a very easy circuit in view of this problem, As a result, the place which contributes to a miniaturization and a cost reduction is size, and also waiting time is made unnecessary at the time of flash photographs.

[0005]

[Means for Solving the Problem]An aforementioned problem is solved by following any they are.

[0006]** A film unit with a lens with a built-in flash plate using for a light source of a flash plate a white light emitting diode which has a chip of three sheets which emits light respectively in red light, blue glow, and green light.

[0007]** A film unit with a lens with a built-in flash plate using for a light source of a flash plate a light emitting diode which emits light in red light, a light emitting diode which emits light in blue glow, and a light emitting diode which emits light in green light.

[0008]

[Embodiment of the Invention]The embodiment in the film unit with a lens with a built-in flash plate of this invention is described in detail with reference to drawing 1 thru/or drawing 6.

[0009]Drawing 1 is a figure of a flash plate light-emitting part, drawing 1 (A) is a front view and drawing 1 (B) is drawing of longitudinal section.

[0010]In the figure, the white light emitting diode in which 1 emits light in flash light, and 2 are reflectors which turn to a photographic subject the flash light in which the white light emitting diode 1 emitted light, and are reflected with a predetermined field angle. The white light emitting diode 1 is a light emitting diode which has a chip of three sheets which emits light respectively in red light, blue glow, and green light, and can also make only arbitrary chips able to emit light among the chips of three sheets, and can also make two or more predetermined chips emit light. When using for the usual flash photographs, red light, blue glow, and green light are made to emit light simultaneously by equivalent colored light. Then, white light emits light by the trichromatic additive color mixture of light. However, what is necessary is just to make light emit by unequal colored light to illuminate a photographic subject in a special color, even if arbitrary chips are made to emit light or it makes the chip of three sheets emit light simultaneously.

[0011]Therefore, when controlling the chip of three sheets arbitrarily, four legs including a grounding terminal are required for the number of the legs of the white light emitting diode 1, and when the white light emitting diode 1 is manufactured so that the chip of three sheets may be made to always emit light simultaneously by equivalent colored light, there should just be two legs.

[0012]Below, a flash plate circuit diagram is explained based on drawing 2. White light emitting diode D is connected with the cell B in series with the resistance R and synchro

switch S-SW. Since white light emitting diode D emits light in abbreviated 1.8V-2.5V, the load resistance R is connected in series and it is connected to two cells used as 3V. Synchro switch S-SW is a switch which is interlocked with the opening motion of the shutter blade which is not illustrated, and serves as one.

[0013] Thus, dramatically, this flash plate circuit is easy and like the conventional strobo circuit, Various kinds of circuits, such as a trigger transformer which gives trigger voltage, are not needed for display circuits, such as booster circuits, such as an oscillation transformer which carries out pressure up of the voltage of a cell to high voltage, a large-sized main capacitor in which the charged electric charge is stored, and a neon bulb which indicates that it charged, and a discharge tube. Therefore, it contributes to a miniaturization greatly, and since it becomes a great cost reduction and also part mark are reduced, reliability improves.

[0014] Since white light emitting diode D always emits light if only synchro switch S-SW is turned on, since charging operation is not needed, the waiting time like a stroboscope becomes it is unnecessary and unnecessary [charge indicating]. Therefore, the problem of missing a shutter chance precious to waiting time until the neon bulb like speed light photography lights up is not produced.

[0015] in addition -- since two cells used as 3V are needed -- a cell -- AAA -- although the small cell like type or single 5 type is preferred, one lithium cell of 3V may be used depending on the case.

[0016] If the same conditions as a stroboscope compare light volume, the flash plate using the present white light emitting diode does not have enough light volume. The following measure is needed in order to solve this problem.

[0017] First, although a film unit with a lens is beforehand loaded with a film by a manufacturing process, since the deficiency of light quantity of a flash plate is suppliable by loading with the film of high sensitivity, it is desirable to use an ISO speed [of 1000 or more] film.

[0018] Although low-speed one can compensate shutter speed with the deficiency of light quantity of a flash plate, Since it becomes that shutter speed is constant speed at overexposure at the photography in daytime, when not using the flash plate in daytime etc., at a high speed and the time of flash photographs, it is desirable a low speed and that the change of shutter speed can be performed. And as for shutter speed, at the time of flash photographs, it is desirable to change to 1/60 or less.

[0019] small as a power supply for flash plates, in order to use 3V -- the AAA of 1.5V -- it is desirable to use a type cell or a single 5 type cell two.

[0020] moreover -- as the power supply for flash plates -- the AA of 1.5V -- a type cell and AAA -- what is necessary is just to constitute, as shown in the flash plate circuit diagram of drawing 3 when using a type cell or a single 5 type cell one

[0021] When main-switch M-SW is provided and main-switch M-SW is made one, by the booster circuit 5 Namely, the driver voltage of white light emitting diode D, That is, pressure up is carried out to not less than about 3.0v, the electric charge is accumulated in the capacitor C, and white light emitting diode D is made to emit light by making the electric charge of the capacitor C discharge by one of synchro switch S-SW.

[0022] As for the timing of a luminescence start, it is desirable to carry out simultaneously with the start of shutter open operation, as shown in the light-emitting timing figure of drawing 4 instead of the time of shutter full admission like the conventional stroboscope,

and to maintain luminescence till the end of shutter closed operation.

[0023]Although one white light emitting diode is used for an above embodiment as a light source of a flash plate, three light emitting diodes which emit light respectively in red light, blue glow, and green light may be collectively used for it.

[0024]The front view of the flash plate light-emitting part constituted in this way is shown in drawing 5. As for 11, a blue photoluminescence diode and 13 are green light light emitting diodes a red light light emitting diode and 12, and 14 is a reflector.

[0025]The flash plate circuit diagram which used the cell B of 3V as a power supply is shown in drawing 6. This flash plate circuit diagram to load resistance R_1 Red light light emitting diode D_1 , It is what connected green light light emitting diode D_3 to load resistance R_2 in series at blue photoluminescence diode D_2 and load resistance R_3 , and there is no difference as fundamentally as the flash plate circuit diagram shown in drawing 2. Therefore, if the opening motion of the shutter blade which is not illustrated is interlocked with and synchro switch S-SW is turned on, Red light light emitting diode D_1 , blue photoluminescence diode D_2 , and green light light emitting diode D_3 emit light simultaneously, and emit light in white light by the additive color mixture of three equivalent colors.

[0026]Photograph expression which illuminates a photographic subject in a special color and dares to serve as unnatural coloring can also be carried out by connecting a switch to each light emitting diode and series respectively, making arbitrary switches turn on and off, and making only one arbitrary piece or two light emitting diodes emit light.

[0027]Since pressure up is carried out using the cell of 1.5V one as shown in drawing 3, it may be made to make a light emitting diode emit light.

[0028]In order to enlarge light volume, two or more white light emitting diodes are used, or it may be made to use two or more light emitting diodes of red light, blue glow, and green light. Especially when using two or more light emitting diodes of red light, blue glow, and green light, each color does not have to make the number the same, and the number of each color may be changed so that it may become the desired luminescent color and luminescence intensity according to the luminescence intensity of each light emitting diode.

[0029]As for the light-emission angle of a light emitting diode, it is desirable to use a thing larger than the photographing field angle of a taking lens.

[0030]When making light emit, the current to send is also a range which does not exceed permissible current carrying capacity, and it is desirable to consider it as the circuit which sends the current near it.

[0031]

[Effect of the Invention]Since according to the film unit with a lens with a built-in flash plate according to claim 1 to 9 the complicated and expensive circuit like the conventional stroboscope is made unnecessary and it becomes very easy circuitry, the place which contributes to a miniaturization and a cost reduction is size. Since photography is always possible and waiting time is unnecessary if the cell of the voltage of 3V which is the voltage which can drive a light emitting diode is used as a power supply, it does not produce missing the shutter chance like the conventional stroboscope.

TECHNICAL FIELD

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PRIOR ART

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1]It is a figure of the flash plate light-emitting part using a white light emitting diode.

[Drawing 2]It is a flash plate circuit diagram using a white light emitting diode.

[Drawing 3]It is the flash plate circuit diagram provided with the booster circuit.

[Drawing 4]It is a light-emitting timing figure.

[Drawing 5]It is a front view of the flash plate light-emitting part using three light emitting diodes.

[Drawing 6]It is a flash plate circuit diagram using three light emitting diodes.

[Description of Notations]

B Cell

S-SW Synchro switch

M-SW Main switch

C.Capacitor

1, D white light emitting diode

2 and 14 Reflector

11, D₁ red light diode

12, D₂ blue light-emitting diode

13, D₃ green light emitting diode
